What is claimed is:

1. A method of etching a substrate, comprising:
depositing an amorphous carbon layer on the substrate;
defining a first pattern in the amorphous carbon layer;
depositing a layer of photoresist on the amorphous carbon layer;
patterning the photoresist;
transferring the pattern in the photoresist through the amorphous carbon layer to form a second pattern in the amorphous carbon layer; and
transferring the first and second patterns in the amorphous carbon layer through the substrate.

2. The method of claim 1, wherein the amorphous carbon layer is deposited by vapor deposition from a gas mixture comprising one or more hydrocarbons having the general formula C_xH_y, wherein x has a range of 2 to 4 and y has a range to 2 to 10.

3. The method of claim 1, wherein the substrate comprises a material selected from the group consisting of silicon, polysilicon, an oxide, a nitride, tungsten, tungsten silicide, aluminum, silicon oxycarbide, and combinations thereof.

4. The method of claim 1, further comprising depositing an anti-reflective coating layer selected from the group consisting of amorphous silicon, silicon nitride, silicon oxynitride, silicon oxide, doped silicon oxide, silicon oxycarbide, carbides, silicon carbide, titanium, and titanium nitride on the substrate before the depositing the amorphous carbon layer.

5. The method of claim 1, wherein the amorphous carbon layer is deposited at a power of between about 1 W/in^2 and about 100 W/in^2.

6. The method of claim 1, further comprising removing the amorphous carbon layer from the substrate after the first and second patterns in the amorphous carbon layer are transferred through the substrate.

7. A method of etching a substrate, comprising:

depositing an amorphous carbon layer on the substrate;

depositing a non-carbon based layer on the amorphous carbon layer;

defining a first pattern in the non-carbon based layer and in the amorphous carbon layer;

depositing a layer of photoresist on the amorphous carbon layer;

patterning the photoresist;

transferring the pattern in the photoresist through the non-carbon based layer and the amorphous carbon layer to form a second pattern in the amorphous carbon layer; and

transferring the first and second patterns in the amorphous carbon layer through the substrate.

8. The method of claim 7, wherein the amorphous carbon layer is deposited by vapor deposition from a gas mixture comprising one or more hydrocarbons having the general formula C_xH_y, wherein x has a range of 2 to 4 and y has a range to 2 to 10.

9. The method of claim 7, wherein the substrate comprises a material selected from the group consisting of silicon, polysilicon, an oxide, a nitride, tungsten, tungsten silicide, aluminum, silicon oxycarbide, and combinations thereof.

10. The method of claim 7, further comprising depositing an anti-reflective coating layer selected from the group consisting of amorphous silicon, silicon nitride, silicon oxynitride, silicon oxide, doped silicon oxide, silicon oxycarbide, carbides, silicon carbide, titanium, and titanium nitride on the substrate before the depositing the amorphous carbon layer.

11. The method of claim 7, wherein the amorphous carbon layer is deposited at a power of between about 1 W/in^2 and about 100 W/in^2.

12. The method of claim 7, wherein the non-carbon based layer is selected from the group consisting of amorphous silicon, silicon nitride, silicon oxynitride, silicon oxide, doped silicon oxide, silicon oxycarbide, carbides, silicon carbide, titanium, and titanium nitride.

13. The method of claim 12, wherein the non-carbon based layer has a thickness of between about 50 Å and about 500 Å.

14. The method of claim 7, further comprising removing the amorphous carbon layer and the non-carbon based layer from the substrate after the first and second patterns in the amorphous carbon layer are transferred through the substrate.

15. A method of etching a substrate, comprising:

depositing an amorphous carbon layer on the substrate;

depositing a first non-carbon based layer on the amorphous carbon layer;

defining a first pattern in the non-carbon based layer and in the amorphous carbon layer;

depositing a second non-carbon based layer on the amorphous carbon layer;

depositing a layer of photoresist on the second non-carbon based layer;

patterning the photoresist;

transferring the pattern in the photoresist through the second non-carbon based layer and the amorphous carbon layer to form a second pattern in the amorphous carbon layer; and

transferring the first and second patterns in the amorphous carbon layer through the substrate.

16. The method of claim 15, wherein the first non-carbon based layer is selected from the group consisting of amorphous silicon, silicon nitride, silicon oxynitride,

silicon oxide, doped silicon oxide, silicon oxycarbide, carbides, silicon carbide, titanium, and titanium nitride.

17. The method of claim 16, wherein the first non-carbon based layer has a thickness of between about 50 Å and about 500 Å.

18. The method of claim 15, wherein the second non-carbon based layer is selected from the group consisting of amorphous silicon, silicon nitride, silicon oxynitride, silicon oxide, doped silicon oxide, silicon oxycarbide, carbides, silicon carbide, titanium, and titanium nitride.

19. The method of claim 15, wherein the amorphous carbon layer is deposited by vapor deposition from a gas mixture comprising one or more hydrocarbons having the general formula C_xH_y, wherein x has a range of 2 to 4 and y has a range to 2 to 10.

20. The method of claim 15, wherein the substrate comprises a material selected from the group consisting of silicon, polysilicon, an oxide, a nitride, tungsten, tungsten silicide, aluminum, silicon oxycarbide, and combinations thereof.

21. The method of claim 15, further comprising depositing an anti-reflective coating layer selected from the group consisting of amorphous silicon, silicon nitride, silicon oxynitride, silicon oxide, doped silicon oxide, silicon oxycarbide, carbides, silicon carbide, titanium, and titanium nitride on the substrate before the depositing the amorphous carbon layer.

22. The method of claim 15, wherein the amorphous carbon layer is deposited at a power of between about 1 W/in^2 and about 100 W/in^2.

23. The method of claim 15, further comprising removing the amorphous carbon layer and the second non-carbon based layer from the substrate after the first and

second patterns in the amorphous carbon layer are transferred through the substrate.